FN-BC04 MP3 Sound Board

User's Manual

Contents

1. Overviews 2
1.1. Brief introduction 2
1.2. Features 2
1.3. Technical parameters 2

2. Connections 2

3. Button Control Mode 3

4. Serial Control Mode 4
4.1. Command Format 4
4.2. About Checksum 4
4.3. Serial Communication Commands 5
4.4. Returned Data from Module 8
4.5. Detailed Annotation of Control Commands 10
4.6. Detailed Annotation of Query Commands 13
4.7. About Delay of Serial Programming 14

1. Overviews

1.1. Brief Introduction

FN- BC04 is a high quality MP3 sound board developed by Flyron Technology Co., Ltd. Equipped with an on-board 10W amplifier, the sound board can be controlled by 4 separate buttons hooked up to the 'one-on-one' inputs terminals and UART R232 serial port. Great audio output, industry-grade design and strong anti-jamming capability make it possible to be used for many different applications.

1.2. Features

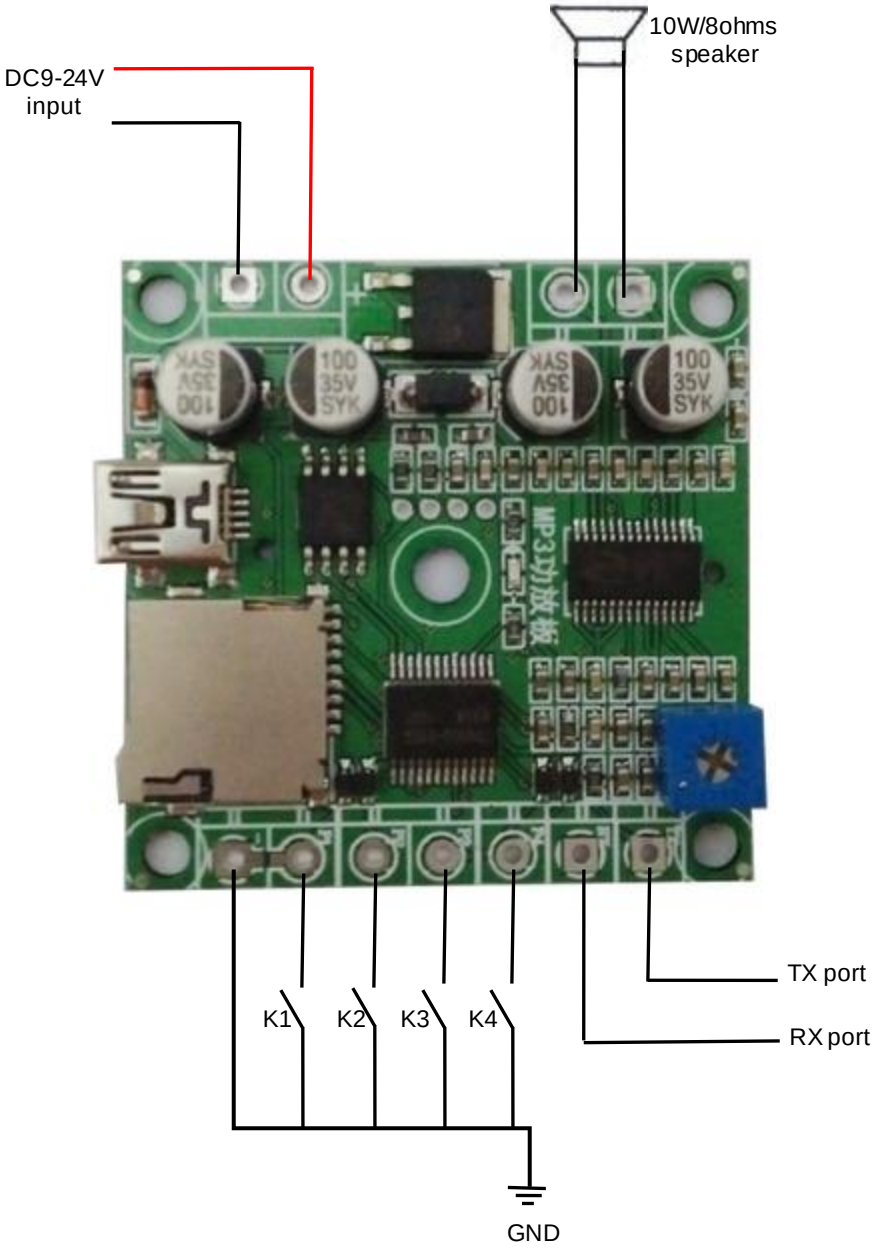
1). With high quality audio decoder, supports MP3 and WAV audio formats.
2). Sampling rates supported: 8/11.025/12/16/22.05/24/32/44.1/48(KHz).
3). 24 bit DAC output and supports dynamic range 90dB and SNR 85dB.
4). Supports one-on-one button control mode and UART serial port control mode.
5). In button control mode, it plays back 4 sounds one-on-one by negative triggering.
6). Uses micro SD card and the built-in SPI flash memory for storage devices.
7). Built-in 4MB SPI flash memory by default, and supports max. 16MB.
8). Supports max. 32GB micro SD card.
9). Possible to load sound files to the flash memory directly via the USB connecting with computer like using a USB flash drive.
10). Built-in a 10 watts amplifiers that can drive a 10 watts speakers directly.
11). Adjustable sound volume with the potentionmeter.
12). Wide range for power input(DC9-24V).
13). PCB size: 46mmx46mm

1.3. Technical Parameters

1). Working voltage: DC 9V-24V
2). Working current: ≤400mA (Input: DC12V)
3). Power Consumption: ≤10W
4). On-board flash memory size: 4MB
5). Audio format: MP3 and WAV

2. Connections

K1 through K4 are representing Normally Open (N.O.) manual buttons. Please refer to the connection example below.



3. Button Control Mode

4 sound files need to be directly stored in the root directory of the SD card or the on-board flash memory. No folders can be in the 'root directory'. The arrangements of the sound files are managed by a physical indexing sequence. In other words, the file that is to be loaded first in the storage device will be associated with input "K1". The last file to be loaded in the storage device will be associated with input "K4". In order to guarantee a correct 'one-on-one' order, please refer to the following steps.

1). Build a new folder on the computer and put the 4 sound files in this new folder.

2). Rename the sound files from 001.mp3/wav to "004.mp3/wav", and make sure they are ranked from "001.mp3/wav" to "004.mp3/wav" in order.

3). Plug in your SD cardon computer or connect the board with computer through the mini USB(make sure the SD card or the on-board flash memory is empty).

4). Format the SD card into FAT or FAT32 or format the on-board flash into FAT.

5). Select all the sound files in the folder.

6). Right click on the first file (001.mp3/wav) and choose "Send to removable disk".

7). This should send the 4 sound files to the SD card or the on-board flash memory in a correct sequence.

8). Once the files transfer is completed, safely remove the SD card and insert it onto the sound boardor disconnect the board from computer.

9). Apply power to the sound board and push any of 4 buttons to play a corresponding sound.

10). For example, push button “K1”, it will play the sound file “001.m p3/wav” and stop; push button “K3”, it will play the sound file “003.mp3 /wav” and stop, etc.

Notes: 1). When the SD card is plugged/inserted into the sound board. Only audio files from the SD card will be played.

2). During playback, if you press the button again, it is possible to interrupt the playback and restart to play the sound file from the beginning .

4. UART RS232 Serial Control Mode

4.1. Command Format

- Communication baud rate: 9600 bps
- Data bits: 1
- Checkout: none
- Flow Control: none

Format: $S / Ver. / Number / Command / Feedback / Param_MSB / Param_LSB / Check_MSB / Check_LSB / $O	
$S	Start byte 0x7E
Ver.	Version byte, 0xFF by default
Number	Number of bytes from version info to Check_LSB, typically 0x06 (checks um not counted)
Command	Command byte
Feedback	0x01: Need feedback --send confirmation back to MCU; 0x00: No need feedback
Param_MSB	Most significant byte of parameter
Param_LSB	Least significant byte of parameter
Check_MSB	Most significant byte of checksum
Check_LSB	Least significant byte of checksum
$O	End byte 0xEF

For example, if we specify playback of SD card, we need to send the command “7E FF 06 09 00 00 02 FF F0 EF”. The number is 6 bytes, and these 6 bytes are “FF 06 09 00 00 02”. Start byte, end byte and checksum are not counted.

4.2. About Checksum

Regarding to calculating checksum, set your 16 bit checks um value to 0. For each byte from the Version byte until the Param_LSB byte, subtract the byte from the checksum.

Normally it's okay whether users choose to use checksum or not, our module can receive serial data with or without checksum, but some of users may use a MCU without crystal oscillator, so if so we strongly suggest users to add checksum to make sure the communication stability.

4.3. Serial Communication Commands

4.3.1 Control commands

Command	Function	Remarks
0 x01	Play Next	
0 x02	Play Previous	
0 x03	Specify playback of a track	See 4.5.1 for details
0 x04	Increase volume	
0 x05	Decrease volume	
0 x06	Specify volume	See 4.5.2 for details
0 x07	N/A (reserved)	
0 x08	Specify single repeat playback	See 4.5.3 for details
0 x09	Specify playback of a device	See 4.5.4 for details
0 x0 A	Set sleep mode	See 4.5.5 for details
0 x0B	Awake from sleep	
0 x0C	Reset	
0 x0D	Play	
0 x0E	Pause	
0 x0 F	Specify playback of a track in a folder	See 4.5.6 for details
0 x13	Inter-cut an advertisement	See 4.5.7 for details
0 x14	N/A (reserved)	
0 x15	Stop playing inter-cut advertisement	See 4.5.8 for details
0 x16	Stop	
0 x17	Specify repeat playback of a folder	See 4.5.9 for details
0 x18	Set random playback	See 4.5.10 for de tails
0 x19	Set repeat playback of current track	See 4.5.11 for de tails
0 x21	Combination playback (playback of a group)	See 4.5.13 for de tails
0 x22	Specify playback of a track with a specific volume level	See 4.5.14 for de tails

4.3.2 Examples of sending control commands

Command Description	Serial Commands [with checksum]	Serial Commands [without checksum]	Notes
Play Next	7E FF 06 01 00 00 00 FE FA EF	7E FF 06 01 00 00 00 EF	
Play Previous	7E FF 06 02 00 00 00 FE F9 EF	7E FF 06 02 00 00 00 EF	
Specify playback of a track (under the root directory)	7E FF 06 03 00 00 01 FE F7 EF	7E FF 06 03 00 00 01 EF	Specify playback of the 1st track
	7E FF 06 03 00 00 02 FE F6 EF	7E FF 06 03 00 00 02 EF	Specify playback of the 2nd track
	7E FF 06 03 00 00 0 A FE EE EF	7E FF 06 03 00 00 0 A EF	Specify playback of the 10th track
Increase volume	7E FF 06 04 00 00 00 FE F7 EF	7E FF 06 04 00 00 00 EF	
Decrees e volume	7E FF 06 05 00 00 00 FE F6 EF	7E FF 06 05 00 00 00 EF	
Specify volume e	7E FF 06 06 00 00 1 E FE D7 EF	7E FF 06 06 00 00 1 E EF	Specified volume is level 30
Specify single repeat playback (under the root directory)	7E FF 06 08 00 00 01 FE F2 EF	7E FF 06 08 00 00 01 EF	Repeatedly play the 1st track
	7E FF 06 08 00 00 02 FE F1 EF	7E FF 06 08 00 00 02 EF	Repeatedly play the 2nd track
	7E FF 06 08 00 00 0 A FE E9 EF	7E FF 06 08 00 00 0 A EF	Repeatedly play the 10th track
Specify playback of a device	7E FF 06 09 00 00 01 FE F1 EF	7E FF 06 09 00 00 01 EF	Specified device is USB flash disk
	7E FF 06 09 00 00 02 FE F0 EF	7E FF 06 09 00 00 02 EF	Specified device is SD card
Set sleep mode	7E FF 06 0 A 00 00 00 FE F1 EF	7E FF 06 0 A 00 00 00 EF	
Awake from sleep	7E FF 06 0B 0 0 0 0 00 FE F0 EF	7E FF 06 0B 0 0 0 0 00 EF	
Reset	7E FF 06 0C 00 00 00 FE EF EF	7E FF 06 0C 00 00 00 EF	
Play	7E FF 06 0D 00 00 00 FE EE EF	7E FF 06 0D 00 00 00 EF	
Pause	7E FF 06 0E 0 0 0 0 00 FE ED EF	7E FF 06 0E 0 0 0 0 00 EF	
Specify playback of a track in a folder	7E FF 06 0 F 00 01 01 FE E A EF	7E FF 06 0 F 00 01 01 EF	Specify track "001" in the folder “01”
	7E FF 06 0 F 00 01 02 FE E9 EF	7E FF 06 0 F 00 01 02 EF	Specify track "002" in the folder “01”
Inter-cut an advertisement	7E FF 06 13 00 00 01 FE E7 E F	7E FF 06 13 00 00 01 EF	Inter-cut track "0001" in the folder “ ADVERT”
	7E FF 06 13 00 00 02 FE E6 EF	7E FF 06 13 00 00 02 EF	Inter-cut track "0002" in the folder “ADVERT”
	7E FF 06 13 00 00 FF FD E9 EF	7E FF 06 13 00 00 FF EF	Inter-cut track "0255" in the folder “ADVERT”
Stop playing inter-cut advertisement	7E FF 06 15 00 00 00 FE E6 EF	7E FF 06 15 00 00 00 EF	Go back and continue to play the music interrupted
Stop	7E FF 06 16 00 00 00 FE E5 EF	7E FF 06 16 00 00 00 EF	Stop all playback tasks
Specify repeat playback of a folder	7E FF 06 17 00 02 00 FE E2 EF	7E FF 06 17 00 02 00 EF	Specify repeat playback of the folder “02”
	7E FF 06 17 00 01 00 FE E3 EF	7E FF 06 17 00 01 00 EF	Specify repeat playback of the folder “01”
Set random playback	7E FF 06 18 00 00 00 FE E3 EF	7E FF 06 18 00 00 00 EF	Random playback of the whole device
	7E FF 06 19 00 00 00 FE E2 EF	7E FF 06 19 00 00 00 EF	Turn on single repeat playback

Set repeat playback of current track	7E FF 06 19 00 00 01 FE E1 EF	7E FF 06 19 00 00 01 EF	Turn off single repeat playback
Specify playback of a track with a specific volume level	7E FF 06 22 00 1 E 01 FE B A EF	7E FF 06 22 00 1 E 01 EF	Play 1st track with volume level 30
	7E FF 06 22 00 0 F 02 FE C8 EF	7E FF 06 22 00 0 F 02 EF	Play 2nd track with volume level 15

4.3.3 Query commands

Command	Function	Remarks
0 x3F	Query current online storage device	See 4.6.1 for details
0 x40	Module returns an error data with this command	
0 x41	Module reports a feedback with this command	
0 x42	Query current status	See 4.6.2 for details
0 x43	Query current volume	
0 x44	N/A (Reserved)	
0 x45	N/A (Reserved)	
0 x46	N/A (Reserved)	
0 x47	Query total track numbers in USB flash disk	
0 x48	Query total track numbers in SD Card	
0 x4B	Query current track in USB flash disk	by physical sequence
0 x4C	Query current track in SD Card	by physical sequence
0 x4E	Query total track numbers in a folder	See 4.6.3 for details
0 x4F	Query total folder numbers in the storage device	See 4.6.4 for details

4.3.4 Examples of sending query commands

Command Description	Serial Commands [with c heck sum]	Serial Commands [without c heck sum]	Notes
Query current online storage device	7E FF 06 3F 00 00 00 FE BC EF	7E FF 06 3F 00 00 00 EF	
Query current status	7E FF 06 42 00 00 00 FE B9 EF	7E FF 06 42 00 00 00 EF	
Query current volume	7E FF 06 43 00 00 00 FE B8 EF	7E FF 06 43 00 00 00 EF	
Query total track numbers in USB flash disk	7E FF 06 47 00 00 00 FE B4 EF	7E FF 06 47 00 00 00 EF	Total file numbers of current device
Query total track numbers in SD card	7E FF 06 48 00 00 00 FE B3 EF	7E FF 06 48 00 00 00 EF	Total file numbers of current device
Query current track in USB flash disk	7E FF 06 4B 00 00 00 FE B0 EF	7E FF 06 4B 00 00 00 EF	Query the track being played
Query current track in SD card	7E FF 0 6 4C 00 00 00 FE AF EF	7E FF 06 4C 00 00 00 EF	Query the track being played

Query total track numbers in a folder	7E FF 06 4E 00 00 01 FE AC EF	7E FF 06 4E 00 01 00 EF	
Query total folder numbers in current storage device	7E FF 06 4F 00 00 00 FE AC EF	7E FF 06 4F 00 00 00 EF	SD card or USB flash disk

4.4. Returned Data from Module

4.4.1 Returned data after the module is powered on

1) After the module is powered on, normally it needs about no more than 500ms to 1500m s (depending on the actual track quantities in the storage device) initialization time. Once the initialization is done, the module returns a data to MCU. If it does not return a data after more than the initialization time, it means there is an error for initialization, and please che ck the hardware connections.
2) The returned data from module after initialization means the current effective s to rage device /online equipment. For example, the module returns 7 E FF 06 3 F 00 00 03 xx xx EF. 0x3F is the returned command by module, and 0x03 represents USB flash and SD card are effective online at the sametime. See the details as below.

Online Equipment	Re turned Data
USB flash online	7E FF 06 3 F 00 00 01 xx xx EF
SD car d online	7E FF 06 3F 00 00 02 xx xx EF
PC online	7E FF 06 3F 00 00 04 xx xx EF
USB flash and SD card online	7E FF 06 3F 00 00 03 xx xx EF

3) MCU cannot send commands to control the module until the initialization of the module is done and a data is returned, otherwise the commands sent by MCU will be ignored and also this will effect initializing of the module.

4.4.2 Returned data after a track is finished playing

Track Played	Returned Data
1st track is finished playing in US B flash	7E FF 06 3C 00 00 01 xx xx EF
2nd track is finished playing in U SB flash	7E FF 06 3C 00 00 02 xx xx EF
1st track is finished playing in SD card	7E FF 06 3D 00 00 01 xx EF
2nd track is finished playing in SD card	7E FF 06 3D 00 00 02 xx xx EF

1) There is a returned data after a track is finished playing. For example, the returned data is 7E FF 06 3C 00 00 01 xx xx EF. 0x3C represents USB flash and 0x3D represents SD card. 0x00 and 0 x01 represents the 1st track. 0x01 and 0xF4 represents the 500th track (0x01F4=500).
2) Because all of the files (tracks) in the storage device are read in physical sequence, the returned data still follow the physical sequence, which needs to be noted.

4.4.3 Returned data of feedback from module

Module returns ACK	7E FF 06 41 00 00 00 xx xx EF

1) In order to enhance stability between data communication, the function of a feedback from module is added. Once there is a feedback to MCU from the module, it means the module has successfully received the command that MCU sent out. 0x41 is the returned command by module.
2) Users are free to choose this feedback or not. It's also fine not to choose this function.

4.4.4 Returned data of errors

Returned Data of Errors	Meaning Description
7E FF 06 40 00 00 01 xx xx EF	Module busy (this info is returned when the initialization is not done)
7E FF 06 40 00 00 02 xx xx EF	Currently sleep mode (supports only specified device in sleep mode)
7E FF 06 40 00 00 03 xx xx EF	Serial receiving error (a frame has not been received completely yet)
7E FF 06 40 00 00 04 xx xx EF	Checksum incorrect
7E FF 06 40 00 00 05 xx xx EF	Specified track is out of current track scope
7E FF 06 40 00 00 06 xx xx EF	Specified track is not found
7E FF 06 40 00 00 07 xx xx EF	Inter-cut error (an inter-cut operation only can be done when a track is being played)
7E FF 06 40 00 00 08 xx xx EF	SD card reading failed (SD card pulled out or damaged)
7E FF 06 40 00 00 0A xx xx EF	Entered in to sleep mode

When the module is powered on, it reads SD card first and if SD card is not available it goes to USB flash drive.

4.4.5 Returned data after a storage device is plugged in or pull out

Stat us	Re turned Da ta
USB flash is plugged in	7E FF 06 3A 00 00 01 xx xx EF
SD card is plugged in	7E FF 06 3A 00 00 02 xx xx EF
USB cable connected to PC is plugged in	7E FF 06 3A 00 00 04 xx xx EF
USB flash is pulled out	7E FF 06 3B 00 00 01 xx xx EF
SD card is pulled out	7E FF 06 3B 00 00 02 xx xx EF
USB cable connected to PC is pulled out	7E FF 06 3B 00 00 04 xx xx EF

0x3A represents a device is plugged in while 0x3B represents a device is pull out. 0x01, 0x02, 0x04 represent

USB flash, SD card and USB cable connected to PC respectively.

4.5. Detailed Annotation of Control Commands

4.5.1 Specify playback of a track (under the root directory of the storage device)

The available selectable tracks are from 1st to 3000th under the root directory of the storage device. Actually it can support more, but if we make it support more, the operation speed will become slow. Usually most of applications do not need to support much more files. Normally if the total track quantity is under 1,000 in the storage device the response speed of the module is quicker than 50ms. If the total track quantity is more than 1000 the response speed is a little slower than 100ms.

1) For example, if set the first track to be played, send the command 7E FF 06 03 00 00 01 FE F7 EF
   - 7E -- - Start byte
   - FF -- - Version Information
   - 06 --- Number of bytes
   - 03 --- Actual command (specify playback of a track)
   - 00 --- 0 x01 : need feedback ; 0 x00 : no need feedback
   - 00 --- Most significant byte of the track (MSB of Parameter)
   - 01 --- Least significant byte of the track (LSB of Parameter) FE --- Most significant byte of checksum (MSB of checksum) F7 - -- Least significant byte of checksum (LSB of checksum) EF --- End byte 0xEF
2) Regarding track selection, if the 100th song (track) is selected to be played, firstly convert 100 to hexadecimal. It is double-byte by default, i.e. 0 x006 4. MS B=0 x00 ; LS B=0 x64

4.5.2 Specify volume

1) Our system power-on default volume is level 30, if you want to set the volume, then directly send the corresponding command.
2) For example, if specify the volume to level 15, send the command 7E FF 06 06 00 00 0F FF D5 EF.
3) MSB=0 x00; LSB=0x0F, 15 is converted to hexadecimal 0x000 F.

4.5.3 Specify single repeat playback (under the root directory of the storage device)

Repeatedly play 1st track	7E FF 06 08 00 00 01 xx xx EF
Repeatedly play 2nd track	7E FF 06 08 00 00 02 xx xx EF
Repeatedly play 3rd track	7E FF 06 08 00 00 03 xx xx EF

During single repeat playback, you can still normally execute the operations Play/Pause, Previous, Next, Volume +/- and repeat playback. Users can specify single track playback or send the stop command to turn off single repeat playback status.

4.5.4 Specify playback of a device

Specify playback of USB flash	7E FF 06 09 00 00 01 FE F1 EF
Specify playback of SD card	7E FF 06 09 00 00 02 FE F0 EF

1) The module supports two types of playback devices (USB flash and SD card). The device must be on-line so it can be specified playback. It automatically detects if a device is on-line or not.

2) It automatically enters into the standby status after specifying a device, waiting MCU to specify a track to play. It takes about 200ms from specifying device to the module finishes initialization of file system. Please wait for 200ms and then send the specified command to play a track.

4.5.5 Set sleep mode, awake from sleep and reset

Set sleep mode	7E FF 06 0A 00 00 00 FE F1 EF
Awake from sleep	7E FF 06 0B 00 0 0 00 FE F0 EF
Reset	7E FF 06 0C 00 00 00 FE EF EF

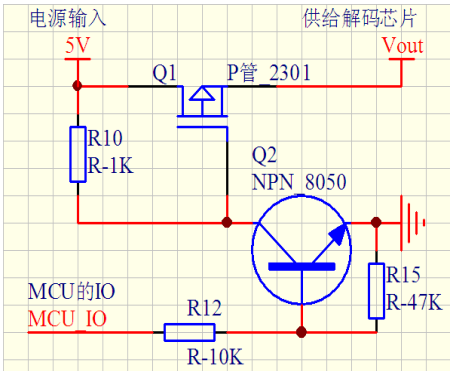
1) After set the module enter into sleep mode, there is also other two ways other than sending the command to awake the module.

   a. Specify playback of the storage device, either USB flash or SD card.

   b. Pull out the storage device and re-plug it in.

2) The reset is a soft reset. The reset time is 5-8 seconds. This allows the reset command under any status.

Note: When the module enters into the sleep mode, the standby power consumption is about 10mA. If users are very strict to the power consumption, you can use a MOS and a transistor to control power supply of the module. It is possible to cut off the power supply completely when standby is not necessary. Please refer to theschematic as below.



4.5.6 Specify playback of a track in a folder

Specify playback of track 001 in the folder 01	7E FF 06 0F 00 01 01 xx xx EF
Specify playback of track 100 in the folder 11	7E FF 06 0F 00 0B 64 xx xx EF
Specify playback of track 255 in the folder 99	7E FF 06 0F 00 63 FF xx xx EF

1) The default folders are named as "01", "11", and “99” in this way. In order to be with better system stability, it is made to support maximum 99 folders and maximum 255 tracks in each folder. For example:

- If specify to play “100.m p3” in the folder "01", send the command 7E FF 06 0F 00 01 64 xx EF MSB: represents the name of the folder, maximum supports 99 folders from 01 - 99. LSB: represents the track, maximum supports 255 tracks from 0x01 to 0xFF
- You must specify both the folder and the file name to target a track. This feature supports MP3 and WAV audio formats.
- The following two images illustrate naming method of folders and files.

4.5.7 Inter-cut an advertisement

Inter-cut track "0001" in the folder “ADVERT”	7E FF 06 13 00 00 01 FE E7 EF
Inter-cut track "0002" in the folder “ADVERT”	7E FF 06 13 00 00 02 FE E6 EF
Inter-cut track "0255" in the folder “ADVERT”	7E FF 06 13 00 00 FF FD E9 EF
Inter-cut track "1999" in the folder “ADVERT”	7E FF 06 13 00 07 CF FE 12 EF
Inter-cut track "3000" in the folder "ADVERT”	7E FF 06 13 00 0B B8 FE 25 EF

1) This module supports inter-cut advertisements during playback of a track, so that it can meet some special needs for some applications.

2) After sending the command 0x13, the system will save the ID V3 information of the track being played and pause, and then it will play the specified inter-cut track (advertisement). When the inter-cut track is finished, the system will go back and continue to play the track that was interrupted until to the end.

3) The setting method is build a folder named “ADVERT” in the storage device and put the tracks (ads) you need in the folder and name the files as “0001 .mp3/wav”, 0002.mp3/wav.

4) If you send an inter-cut command when the module is at Pause status or Stop status, it will not work and there will be returned error information. In the course of an inter-cut, you can continue to intercut the other tracks (ads). When the last inter-cut track goes to the end, the systems till goes back to the ID V3 position saved at the first time.

4.5.8 Stop

Stop playing inter-cut advertisement	7E FF 06 15 00 00 00 FE E6 EF
Stop	7E FF 06 16 00 00 00 FE E5 EF

During playback of the module, there are two modes to stop. One is to stop playing the inter-cut advertisement, and go back and continue to play the music interrupted and the other mode is to stop all playback (stop decoding). For example, suppose the module is playing an inter-cut advertisement and now if send a stop command 0x16, it will stop all playback tasks.

4.5.9 Specify repeat playback of a folder

Specify repeat playback of the folder “02”	7E FF 06 17 00 00 02 FE E2 E F
Specify re pea t playback of the folder “01”	7E FF 06 17 00 00 01 FE E3 E F

The folder names must be 01- 99, and no more than 99. After sending the command, it repeatedly plays the tracks in the specific folder and it will not stop until it receives a command to stop.

4.5.10 Set random playback

Random playback of the whole s to rage de vice	7E FF 06 18 00 00 00 FE E3 EF

This command is used to randomly play all of the tracks in the storage device according to physical sequence and no matter if there is a folder or not in the device.

4.5.11 Set repeat playback of current track

Turn on single repeat playback	7E FF 06 19 00 00 00 FE E2 EF
Turn off single repeat playback	7E FF 06 19 00 00 01 FE E1 EF

During playback, send the turn-on command, and it will repeatedly play the current track. If the module is at Pause or Stop status, it will not respond to this command. If you need to turn off repeat playback, just send the turn-off command.

4.5.12 Specify playback of a track with a specific volume level (under the root directory)

Play 1st track at volume level 30	7E FF 06 22 00 1E 01 FE BA EF
Play 2nd track at volume level 15	7E FF 06 22 00 0F 02 FE C8 EF

1) This function is added to meet some users’ needs to play a track at a specific volume level with one command only, but this only can be executed for the tracks under the root directory of the storage device. The command is 0x22.

2) For normal operations, users still need to send the volume command first and then specify playback of a track with the corresponding command like most of MP3 players.

4.6. Detailed Annotation of Query Commands

4.6.1 Query current online storage device

Query current online storage device	7E FF 06 3F 00 00 00 FE BC EF

When the module is working, users can use the command as above (0x3F) to query the status of the online storage devices. For example, if the module returns the data 7E FF 06 3F 00 00 0A xx xx EF, LSB 0x0A (0000 1010) represents SD card online. If LSB is 0x1F (0000 1111), it represents all of USB flash, SD card and PC online (PC online means module is connecting with PC via a USB cable).

4.6.2 Query current status

Query current online storage device	7E FF 06 42 00 00 00 FE B9 EF

1).There are 4 status (playing, paused playing, stopped playing and in sleep) that can be queried during the module is decoding. Users can query the current status via sending the command as above (0 x42)

2). Interpretation of returned data

Returned Data	Status
7E FF 06 42 00 01 01 xx xx EF	USB flash is being played
7E FF 06 42 00 02 02 xx xx EF	SD card is paused playing
7E FF 06 42 00 01 00 xx xx EF	USB flash is stopped playing
7E FF 06 42 00 10 00 xx xx EF	Module in sleep

3). MSB and LSB Representations

MSB Representation		LSB Representation	
0x01	USB flash	0x00	Stopped
0x02	SD card	0x01	Playing
0x10	Module in sleep mode	0x02	Paused

4.6.3 Query total track numbers in a folder

Query total track numbers in folder 01	7E FF 06 4E 00 00 01 FE AC EF
Query total track numbers in folder 11	7E FF 06 4E 00 00 0B FE A2 EF

If the folder queried is empty without any files, the module will report an error and the data 7E FF 06 40 00 00 06 FE B5 EF will be returned.

4.6.4 Query total folder numbers in current storage device

Query total folder numbers in current storage device	7E FF 06 4 F 00 00 00 FE AC EF

Users can query the total folder numbers of the current storage device through sending the command above. This just supports to query the folder numbers under the root directory of the device. Not possible to query the sub-folder numbers (Please do not build any sub-folders under a folder).

4.7. About Delay of Serial Programming

1). After the module is powered on, it needs about 500ms to 1500ms (depending on the track quantities in thestorage device) to initialize. After that, some data related to initialization returns to MCU. Users can choose to ignore these data.

2). After specifying playback of a device (SD card or USB flash), it needs 200ms delay before sending the command to execute the relative operation.

3). The module processes a serial data per 10ms, so when MCU continuously sends commands one by one, 20ms delay must be added before sending next command, otherwise the command MCU sends out will not be executed.

4). If specifying playback of a track in a folder, the delay must be longer than 40ms, as it needs time to target a track in a folder. And even so song as sending the commands related to query a track or a folder, 40ms delay is required.